

10/Appeal
Brief
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NJP

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PATENT APPLICATION
Attorney Docket No. 10951105-6

4
5 **IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
6

7 **Inventor(s): Gary B. Gordon**

8 **Serial No.: 09/691,318** **Examiner:** R. Laneau

9 **Filed:** October 18, 2000 **Group Art Unit:** 2674

10 **Title: METHOD AND SYSTEM FOR TRACKING ATTITUDE**

11 **RECEIVED**

12 APR 05 2002

13 **Commissioner for Patents**
14 **Washington, D.C. 20231** Technology Center 2600

15 **ATTENTION: BOARD OF PATENT APPEALS AND INTERFERENCES**

16 **APPELLANT'S BRIEF**
17 (37 CFR 1.192)

18
19 This Brief is in furtherance of the Notice of Appeal, filed in this case on
20 February 1, 2002. The fees required under 37 CFR 1.17(f) are dealt with in the
21 accompanying Transmittal of Appellant's Brief.

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04/09/2002 KHALING I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope
01 FC:120 26 addressed to: Commissioner for Patents, Washington, D.C. 20231.
27

28 Date of Deposit: March 25, 2002

Judith E. Brown
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I. REAL PARTY OF INTEREST

The real party of interest in this Appeal is the party identified on the first page of this Brief. That is, the real party in interest is Agilent Technologies, Inc., as assignee of rights from the inventor.

II. RELATED APPEALS AND INTERFERENCES

9 There is no other appeal or interference that will directly affect, or be
10 directly affected by, or have a bearing on the Boards' decision with regard to this
11 Appeal.

III. STATUS OF CLAIMS

15 There are four pending claims in the application. Claims 17, 19, 20 and
16 22 are pending. Claims 17, 19, 20 and 22 have been rejected under 35 U.S.C. 103(a).

All of the pending claims are on appeal.

IV. STATUS OF AMENDMENTS

20 An Amendment after Final Office Rejection was filed on December 3,
21 2001. Claims 18 and 21 were cancelled. Amendments to claims 17, 19, 20 and 22
22 were proposed. The proposed changes were intended to overcome rejections under
23 35 U.S.C. 103(a).

24 In a subsequently mailed Advisory Action, it was asserted that the
25 proposed amendments did not overcome the rejection, but that the proposed amend-
26 ments would be entered upon the timely submission of a Notice of Appeal and Appeal
27 Brief with the requisite fee. Therefore, the list of claims within the Appendix of this
28 Appeal Brief incorporates the changes to the claims.

V. SUMMARY OF THE INVENTION

3 The invention relates to an arrangement of a lens system and photo-
4 sensors in an array. The lens system (26 in Fig. 1) has a characteristic of introducing
5 curvilinear distortion of an image when focusing the image onto the array of photo-
6 sensors. On the other hand, the array is claimed as having a shape to achieve
7 compensation for the curvilinear distortion introduced by the lens system.

8 Fig. 7 of the application as originally filed shows three positions of a
9 T-shaped feature imaged with a distortion-free lens system onto a 32×32 pixel array
10 (220). Because the lens system does not introduce curvilinear distortion, the shape of
11 the T-shaped feature does not change with travel across the array. On the other hand,
12 Fig. 8 illustrates the same feature imaged onto three positions of the pixel array using
13 a simple lens system, so that curvilinear distortion is introduced. Fig. 9 shows in a
14 stylized manner the way in which the feature will then be interpreted by the processing
15 circuitry. As is explained on page 24, lines 3–32 of the application as originally filed,
16 the T-shaped feature will be viewed differently as it changes position within the array.
17 This reduces the quality of the image process.

18 While Figs. 8 and 9 illustrate the prior art, Fig. 10 illustrates a two-
19 dimensional array (226) of photosensors configured in the manner described in the
20 pending claims. That is, the two-dimensional array of photosensors is configured to
21 achieve compensation for the curvilinear distortion introduced by the lens system.
22 Again, a T-shaped feature is shown in three different positions. It can be noted that
23 although the three images of the feature are still distorted, the distortion causes the
24 images to fit within the pixels. Thus, each image of the T-shaped feature will be
25 viewed as being rectangular by the image processing circuitry (see Fig. 11).

26 In the array (226) of photosensors of Fig. 10, the optical axis is at the
27 center of the array and vertical boundaries that space apart adjacent photosensor
28 columns at or near the optical axis are relatively straight, as compared to the vertical

1 boundaries between columns that are at or near the left and right edges of the array.
2 That is, the curvatures of the arcuate vertical boundaries between columns in Fig. 10
3 increase with departure from the optical axis. The embodiment of Fig. 10 also fits
4 within the description of dependent claims 19 and 22, since adjacent rows of photo-
5 sensors in the array are spaced apart by arcuate horizontal boundaries, with curvature
6 of the horizontal boundaries increasing with departure from the optical axis of the
7 array.

8

9

VI. ISSUES

10

11 The following issue is presented for review: Whether claims 17, 19, 20
12 and 22 are patentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,003,773 to Durbin
13 et al.

14

15

VII. GROUPING OF CLAIMS

16

17 The claims do not stand and fall together, since independent claims 17
18 and 20 describe a photosensor array having one dimension of boundary curvature
19 (column-to-column), while dependent claims 19 and 22 add description of a second
20 dimension of boundary curvature (row-to-row), Appellant respectfully requests
21 reconsideration of the independent claims as one group and the dependent claims as
22 a second group.

23

24

VIII. ARGUMENTS

25

26

27 In an Office action mailed October 2, 2001, it was correctly pointed out
28 that Appellant contends that the standard which must be applied in the obviousness
determination under Section 103(a) is that there must be some suggestion or

1 motivation, either in the cited references or in the knowledge generally available to one
2 of ordinary skill in the art, to modify a reference or to combine reference teachings.
3 In re Fine, 5 USPQ2d 1596 (Fed. Cir. 1988). However, as a response to Appellant's
4 statement of the standard, the Office action (1) implied that Appellant argued that it
5 is necessary for a reference to expressly suggest changes or improvements and
6 (2) stated that the test for combining references is what the references as a whole
7 would have suggested to one of ordinary skill in the art. Appellant agrees that sug-
8 gestions regarding changes or improvements do not need to be expressly stated, but
9 points out that the "test" set forth in the Office action regarding combining references
10 is irrelevant with regard to determining the patentability of the pending claims. The
11 rejection of claims 17, 19, 20 and 22 is based solely upon the Durbin et al. patent.
12 Thus, a *prima facie* case of obviousness of the pending claims is established only if
13 there is a suggestion or motivation to modify the Durbin et al. teachings, where the
14 suggestion or motivation is found either in the Durbin et al. patent or in the knowledge
15 generally available to one of ordinary skill in the art.

16 In applying the teachings of Durbin et al. to the pending claims, the
17 October 2, 2001 Office action relied upon the accuracy of different conclusions that
18 certain features of Durbin et al. are inherent. Firstly, it is stated that the Durbin et al.
19 patent does not specifically disclose that the shape of the photosensor array would
20 achieve compensation, "but this is an inherent feature for photosensor arrays having a
21 lens system." If this statement is that the lens system provides the compensation,
22 Durbin et al. teaches away from the claimed invention, since independent claims 17
23 and 20 describe the lens system as having a characteristic of introducing curvilinear
24 distortion of an image. On the other hand, if the Office action is stating that photo-
25 sensor arrays inherently achieve compensation of the curvilinear distortion introduced
26 by the lens system, Appellant respectfully, but assertively, contends that this is
27 contrary to "the knowledge generally available to one of ordinary skill in the art."
28 Therefore, a *prima facie* case of obviousness is not established. Secondly, the Office

1 action cites Fig. 1 of Durbin et al. for an array of photosensors disposed in columns
2 and rows and alleges that "having the columns spaced apart by an arcuate boundary
3 with radii increasing with departure of curvature is an inherent feature." Fig. 1 of
4 Durbin et al. illustrates a rectangular array of rectangular photosensors. Appellant
5 asserts that it is not inherent to include arcuate boundaries between adjacent columns
6 of photosensors. In fact, the arcuate boundaries described in the pending claims
7 directly contradict the description of the array that is illustrated in Fig. 1 of Durbin et al.
8 Thus, for a second reason, the *prima facie* case of obviousness has not been
9 presented. These two reasons as to why the pending claims are patentable over the
10 Durbin et al. patent will be addressed in greater detail in sections that follow.
11 Moreover, additional reasons for determining that the pending claims are patentable
12 over the prior art will be identified.

13

14 A. Shaping the Photosensor Array to Achieve Compensation of Curvilinear Distortion

15

16 Independent claims 17 and 20 describe the array as having a shape to
17 achieve compensation of curvilinear distortion introduced by the lens system. The
18 validity of the rejection of the claims is dependent upon the accuracy of the conclusion
19 set forth in the Office action that achieving compensation is an inherent feature of
20 photosensor arrays having a lens system. More specifically, it is the photosensor array
21 itself that must inherently achieve compensation, if it is to be held that Durbin et al.
22 presents a *prima facie* case of obviousness. However, in Fig. 8 of Appellant's
23 application as originally filed, the same T-shaped feature is shown at three locations
24 within a single photosensor array (222). Fig. 9 of Appellant's application represents
25 how the feature will be "viewed" at the three positions. This rectangular photosensor
26 array having square photosensing elements does not inherently achieve compensation
27 of the curvilinear distortion shown in Fig. 8. Instead, two of the three T-shaped
28 features are shown as being mis-shaped as a consequence of curvilinear distortion.

1 The phenomenon is well known in the optical and photosensor art. Photosensor
2 arrays do not inherently provide compensation for the phenomenon.

3 Fig. 1 of Durbin et al. is cited in the Office action. This figure includes
4 rectangular photosensor elements, similar to Figs. 8 and 9 of the pending application.
5 Thus, the operations will be similar. The shape of the array described in Durbin et al.
6 does not inherently provide compensation for curvilinear distortion. Consequently,
7 Appellant respectfully asserts that the logic identified as grounds for rejecting the
8 pending claims under Section 103(a) is not based on fact, if it is interpreted as a
9 statement that photosensor arrays inherently achieve compensation for curvilinear
10 distortion introduced by a lens system.

11 A second possible interpretation of the inherency assertion is that the
12 compensation for curvilinear distortion is provided by the lens system, since the rejec-
13 tion of the claims states that it is an "inherent feature for photosensor arrays having a
14 lens system" to achieve compensation. However, in a proper Section 103(a) deter-
15 mination, claims must be considered as a whole. Stratoflex, Inc. v Aeroquip Corp.,
16 218 USPQ 871 (Fed. Cir. 1983). Both independent claim 17 and independent claim 20
17 state that the lens system of the present invention has a characteristic of introducing
18 the curvilinear distortion of the image directed to the photosensor array. Conse-
19 quently, if the lens system of the prior art or the lens system to be applied to the Durbin
20 et al. photosensor array provides compensation for curvilinear distortion, the prior art
21 teaches directly away from the claimed invention. Courts are unanimous in holding
22 that references that lead away from the claims at issue are evidence of the patent-
23 ability of the claims. W.L. Gore & Associates, Inc. v Garlock, Inc., 220 USPQ 303
24 (Fed. Cir. 1983). Thus, if the Office action statement regarding the inherency of
25 achieving compensation is referring to use of the lens system to provide the com-
26 pensation, this interpretation is inconsistent with the claims as a whole, so that a *prima
facie* case of obviousness has not been presented.

28

1 As a third possible approach to interpreting the statement that it is an
2 inherent feature for photosensor arrays having a lens system to achieve compensa-
3 tion, the term "compensation" can be interpreted broadly to include compensation for
4 different types of distortion. The Durbin et al. patent does describe a number of
5 techniques for achieving distortion compensation. However, none of the techniques
6 includes providing an array having arcuate edges or providing arcuate boundaries
7 between adjacent columns and/or adjacent rows of photosensors. In column 18 of the
8 patent, it is stated that compensation may occur at the optics, the reader, or the elec-
9 tronic processing. The optical correction occurs if the magnification of the optics is
10 tailored in one of three identified manners. However, tailoring the optics to provide
11 compensation is inconsistent with the invention described in the pending claims, since
12 independent claims 17 and 20 describe the lens system as having a characteristic of
13 introducing curvilinear distortion, rather than correcting distortion. As an alternative in
14 achieving compensation, column 18 of Durbin et al. states that the reader (12) may be
15 increased in resolution (number of pixels per row and column) to modify the apparent
16 height-to-width ratio of the generated image so as to more closely correspond to the
17 height-to-width ratio of the labels being read. However, this increase in resolution of
18 the sensor does not teach or suggest the claimed invention, since the shape of the
19 photosensor array is not varied and the columns are not spaced apart by arcuate
20 boundaries.

21 As another alternative to providing compensation in accordance with
22 Durbin et al., column 18 states that the sensor may be oriented obliquely, such that the
23 plane of the sensor substantially coincides with the plane of the image (20) that is
24 generated. In this manner, the distortion that is caused by oblique scanning can be
25 automatically corrected. This orientation does not teach or suggest the claimed
26 invention. Appellant does not broadly claim to have invented compensation for
27 distortion. Rather, Appellant's claims are directed to the invention described with
28 reference to Fig. 10 of the specification as originally filed. By teaching that the

1 photosensor array is rectangular in shape, the prior art reference teaches away from
2 the claimed invention. Therefore, Durbin et al. does not present a *prima facie* case of
3 obviousness.

4 In conclusion, Figs. 8 and 9 in Appellant's application as originally filed
5 illustrate curvilinear distortion introduced by a lens system in imaging a T-shaped
6 feature onto three positions of a photosensor array and illustrate that the photosensor
7 array does not inherently compensate for the curvilinear distortion introduced by the
8 lens system. Appellant asserts that the Section 103(a) rejection of the pending claims
9 is flawed, since it is inaccurate to state that a photosensor array having a lens system
10 inherently achieves compensation for curvilinear distortion. It follows that the pending
11 claims are in an allowable condition.

12

13 **B. The Teachings of Durbin et al. Regarding Arcuate Boundaries**

14

15 In addressing the claimed features regarding arcuate boundaries, the
16 October 2, 2001, Office action asserts that as per these claims, (1) Durbin et al.
17 teaches photosensors that are disposed in columns and rows, citing Fig. 1 of Durbin
18 et al., and (2) alleges that "having the columns spaced apart by an arcuate boundary
19 with radii increasing with departure of curvature is also an inherent feature." Appellant
20 respectfully disagrees.

21 The Durbin et al. patent teachings with regard to the cited Fig. 1 are
22 consistent with the arrays shown in Figs. 8 and 9 of Appellant's pending application as
23 originally filed. Fig. 1 of Durbin et al. is illustrated and described as being comprised of
24 an array of pixels in which the resolution per individual pixel is 0.004 inch by 0.005 inch
25 (column 9, lines 22–25 of the patent). There are 492 pixels in the vertical direction
26 and 512 pixels in the horizontal direction. Thus, the combined resolution in the
27 horizontal direction is 2.560 inches (0.005×512) and the combined resolution in the
28 vertical direction is 1.968 inches (0.004×492). This is very close to the dimensions

1 taught in Fig. 1, which are 2.580 inches by 1.940 inches. Clearly, the rectangular
2 pixels are in a side-by-side arrangement. More importantly, the columns of rectangular
3 photosensors are not spaced apart by arcuate boundaries, since the stated dimen-
4 sions of the array would not tolerate arcuate boundaries between adjacent columns
5 (Appellant's independent claims) or arcuate boundaries between adjacent rows
6 (Appellant's dependent claims). Consequently, it is inaccurate to state that having
7 columns of photosensors spaced apart by an arcuate boundary is inherent and it is
8 inaccurate to state that the Durbin et al. patent presents a *prima facie* case of obvious-
9 ness with regard to the pending claims.

10 Fig. 8 of Appellant's application illustrates a photosensor array having
11 columns and rows of photosensors. In comparison to Fig. 1 of Durbin et al., the
12 individual photosensors of Fig. 8 are square, rather than rectangular. However, in
13 both cases, the boundaries between adjacent columns and the boundaries between
14 adjacent rows are linear, rather than being arcuate. Moreover, as in Durbin et al., no
15 boundary increases in curvature. Again, having columns of photosensors spaced
16 apart by arcuate boundaries is not an inherent feature. Appellant asserts that the
17 Office action does not present a *prima facie* case of obviousness with regard to the
18 pending claims.

19

20 C. The Teachings of Durbin et al. Regarding Structural
21 Variations "With Departure of Curvature"

22

23 In addressing the patentability of the invention, the Office action of
24 October 2, 2001, mischaracterizes the invention. The mischaracterization is carried
25 forward from the previous Office action of April 25, 2001. In both Office actions, the
26 obviousness of the claimed structure was examined with respect to "departure of
27 curvature." None of the pending claims describes structure with respect to departure
28 of curvature. Rather, the structure is described with reference to "departure from said

1 optical axis" of the photosensor array. The analysis of the structure of a column-to-
2 column boundary or a row-to-row boundary "with departure of curvature" is significantly
3 different than the description of the structure of the column and row boundaries with
4 respect to "departure from the optical axis of the array."

5 Appellant respectfully asserts that when the Section 103(a) determination
6 is applied to an accurate interpretation of the claim language, the claims are in an
7 allowable condition.

8

9 D. The Teachings of Durbin et al. Regarding the Shape of the Photosensor Array

10

11 The paragraph that is found in column 15, lines 4–13 of Durbin et al. was
12 cited for its teachings regarding the shape of the photosensor array. This paragraph
13 states that while the current state of the art of photosensor arrays is to provide a
14 rectangular shape, other shapes may be substituted. In response, Appellant points
15 out that changing the shape of the photosensor array would not render the pending
16 claims obvious under Section 103(a), since the pending claims describe arcuate
17 boundaries between adjacent columns (independent claims 17 and 20) and between
18 adjacent rows (dependent claims 19 and 22). Even if one were to modify the photo-
19 sensor array of Durbin et al. to have a shape other than a rectangular, it would not be
20 an inherent feature to have arcuate boundaries between adjacent columns.

21 As is well known in the art, it is conventional to form straight lines during
22 integrated circuit fabrication. Adding curvature to features formed using conventional
23 wafer fabrication techniques significantly adds to the cost of the fabrication process.
24 Modifying the rectangular array of Durbin et al. could be carried out simply and
25 economically by forming the array as taught by Fig. 1 of the patent and then removing
26 portions of the array to provide the desired non-rectangular shape. This would be the
27 conventional approach. Arcuate boundaries between adjacent columns of photo-
28 sensors are not inherent to photosensor arrays having arcuate outer edges. Again,

1 Appellant asserts that a *prima facie* case of obviousness has not been presented by
2 the citation of the Durbin et al. patent.

3 The alleged motivations for modifying the teachings of Durbin et al. are
4 that there would be "automatic control of the lens system" and that there would be a
5 better displayed image when looking at a distance. However, nothing within the Durbin
6 et al. patent teaches or suggests that automatic control of the lens system may be
7 achieved by shaping the photosensor array. Rather, the cited paragraph in column 15
8 of Durbin et al. merely states that the shape of the lens is based on the shape of the
9 photosensor array. Nothing within the rejection of the pending claims provides
10 explanation as to how the structure of the photosensor array achieves "automatic
11 control" of the lens system. Appellant's claimed invention does not provide automatic
12 control of the lens system. In fact, the structure of the claimed photosensor array
13 relaxes the requirements of the lens system, since the lens system can have a
14 characteristic of introducing curvilinear distortion of the image focused onto the array.

15

16 E. Conclusion

17

18 Appellant respectfully asserts that it is inaccurate to state that a
19 photosensor having columns and rows of photosensors inherently includes arcuate
20 boundaries between adjacent columns, with the curvatures of the arcuate boundaries
21 increasing with departure from the optical axis of the photosensor array. In fact,
22 Figs. 8 and 9 of Appellant's application, as well as the description regarding Fig. 1 of
23 the cited patent to Durbin et al., show photosensor arrays that do not include this
24 feature.

25 Appellant respectfully points out that the rejection of the claims
26 mischaracterizes the claimed invention, since it refers to the inherency, or obvious-
27 ness, of structural features based upon "departure of curvature." On the other hand,
28 the pending claims describe structural features on the basis of "departure from said

1 optical axis" of the photosensor array. Specifically, curvatures of the arcuate
2 boundaries increase with departure from the optical axis, as set forth in the pending
3 claims. When the language of the claims is properly interpreted, the pending claims
4 are patentable over the teachings of Durbin et al.

5 The pending claims state that the lens system has a characteristic of
6 introducing curvilinear distortion of an image focused on the photosensor array and
7 that the array is structured to achieve compensation of the curvilinear distortion. The
8 Office action agrees that the Durbin et al. patent does not specifically disclose that the
9 shape of the array achieves compensation, but asserts that "this is an inherent feature
10 for photosensor arrays having a lens system." Unfortunately, the rejection does not
11 explain this assertion regarding inherent features. Figs. 8 and 9 of Appellant's
12 application as originally filed show that the shape of a photosensor array does not
13 inherently achieve compensation for curvilinear distortion.

14 It is respectfully submitted that the citation of the Durbin et al. patent
15 does not present a *prima facie* case of obviousness of the pending claims, when the
16 claims are properly interpreted.

17

18 IX. RELIEF SOUGHT

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20 Appellant respectfully requests reversal of the rejection under 35 U.S.C.
21 103(a). An indication of patentability of the claimed invention is sought.

22

23 Respectfully submitted,
24 Gary B. Gordon

25 
26

27 Date: March 25, 2002
28 Terry McHugh
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1 APPENDIX

2 CLAIMS INVOLVED IN THE APPEAL

3 17. (amended) An arrangement of a sensor and optics comprising:

4 an array of photosensors; and

5 a lens system for providing a focus for imaging by said array, said lens
6 system having a characteristic of introducing curvilinear distortion of an image to said
7 array;

8 said array having a shape to achieve compensation of said curvilinear
9 distortion, including having arcuate edges to establish said compensation;

10 wherein said photosensors are disposed in a plurality of columns and a
11 plurality of rows and wherein said photosensors combine to define an optical axis for
12 said array, adjacent columns being spaced apart by an arcuate boundary, with
13 curvatures of said arcuate boundaries increasing with departure from said optical axis.

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17 19. (amended) The arrangement of claim 17 wherein adjacent rows are spaced apart
18 by second arcuate boundaries, with curvature of said second arcuate boundaries
19 increasing with departure from said optical axis.

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1 20. (amended) An arrangement of a sensor and optics comprising:
2 a two-dimensional array of photosensors; and
3 a lens system for providing a focus for imaging by said array, said lens
4 system having a characteristic of optically introducing curvilinear distortion of an image
5 to said array;

6 said array having a curvilinear shape to achieve compensation of said
7 curvilinear distortion, including having a plurality of arcuate outer edges to establish
8 said compensation, said photosensors being varied dimensionally to define said
9 curvilinear shape, said curvilinear shape being aligned relative to said curvilinear
10 distortion to introduce a physical distortion that offsets said optically introduced
11 curvilinear distortion;

12 wherein said photosensors are disposed in a plurality of columns and a
13 plurality of rows and wherein said photosensors combine to define an optical axis for
14 said array, adjacent columns being spaced apart by an arcuate boundary, with
15 curvatures of said arcuate boundaries increasing with departure from said optical axis.

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19 22. (amended) The arrangement of claim 20 wherein adjacent rows are spaced apart
20 by second arcuate boundaries, with curvature of said second arcuate boundaries
21 increasing with departure from said optical axis.

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